Social accounting matrices. The development and application of SAMs at the local level

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Social Accounting Matrices

The development and application of SAMs at the local level

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Abstract

This contribution aims to highlight the importance of Social Accounting Matrices (SAMs) for the study of regional-economic interactions. After a conceptual review of SAMs, the attention is focused on the empirical meaning of SAMs for economic impact assessment. The potential of SAMs is illustrated by an extensive pedagogical treatment of this tool on the basis of several town-hinterland interactions in 5 different European countries.

INTRODUCTION

The Social Accounting Matrix (SAM) has a respectable history in economic research. It comprises a comprehensive, disaggregated, consistent and complete data collection that captures the interdependences that exist within a socio-economic system (Isard et al., 1998). When, for example, households would have to pay less tax, they could spend more money on fresh food or beverages. They might then go to a supermarket and spend a larger share of their income there. As a result, the supermarket -or the retail sector in general- needs to obtain more products from the food production sector, which raises its demand for agricultural products. Because of this increasing demand, more labour input is needed which increases the income of certain households even more, who again could spend more money. This kind of interdependency between sectors and households can very well be captured within a SAM.

SAMs were initially developed because of a growing dissatisfaction with the distributional effects of conventional growth policies, especially in developing countries (see, e.g., Adelman and Robinson, 1978; Pyatt and Round, 1977). In these countries income redistribution is often an important concern. Therefore, researchers in the late 1970s were eager to learn more about the processes and mechanisms dealing with the production of goods and services as well as with the associated income formation and income distribution. Traditionally, input-output models (developed by Leontief already in 1951) were used to analyse production linkages in an economy. Input-output analysis is an established technique in quantitative economic research. It belongs to the family of impact assessment methods and aims to map out the direct and indirect consequences of an initial impulse into an economic system across all economic sectors. It is essentially a method that depicts the system-wide effects of an exogenous change in a relevant economic system (van Leeuwen et al., 2005).

Input-output models are based on the idea that any output requires a corresponding input. Such input may comprise raw materials and services, all coming from other sectors but also labour from households or certain amenities provided by the government. The output consists of a sectoral variety of products and services. Most input-output models are structured to trace changes in the flows of capital and labour between industries in response to a change in final demand; they are demand driven. However, a conventional input-output model does not take into account the link between increased output, the factorial and household income distribution and increased consumption. Therefore, a new kind of model had to be developed. SAMs combine data on production and income generation, as can be found in input-output tables, together with data about incomes received by different institutions and on the spending of these incomes. Therefore, a SAM allows us not only to analyse (regional) production linkages but also to focus on production-income and income-expenditure relations in a given area, so that distributional effects of a change in final demand can be analysed.

Nowadays, a natural extension of a SAM, a static framework with fixed prices, is a computable general equilibrium (CGE) model, which can be considered dynamic with endogenized prices (Isard et al. 1998). CGE models use a SAM as the base-year but they include also a number of behavioural and structural relationships to describe the behaviour of various actors over time. The CGE approach permits prices of inputs to vary with respect to changes in output prices and, thus, allows the behaviour of economic agents to be captured (van den Bergh and Hofkes, 1999). Notwithstanding the advantages of CGE models, we will address SAMs in this chapter. An important reason for this is that SAMs are able to handle a very disaggregated sector structure. In our empirical analysis, the economic linkages between town and hinterland actors will be described. It is generally thought that towns are important concentration points of economic activities in rural areas, thereby having the capacity to act as a focal point of trade and services for the hinterland. Our analysis will focus on the current economic structure of towns and hinterland, and on existing linkages between those areas using 30 European SAMs describing the local town and hinterland economy (see Appendix A.I for a list of the towns, their population and number of jobs).

In this chapter, we will first describe the SAM framework, including examples of existing SAM-based studies, the structure of a SAM, and its advantages and disadvantages. Next, we will focus on regional SAMs, including the development of a SAM at town level. Then, multiplier analysis will be explained followed by a section with empirical results, describing interregional SAM multipliers at the town-hinterland level. Finally, conclusions are formulated.

THE SAM FRAMEWORK

Examples of SAM-based studies

The SAM methodology has been used extensively to analyse a variety of different questions at different levels of geographical aggregation (Isard et al., 1998).

In developing countries, it has been used widely to explore issues such as income distribution (Adelman and Robinson, 1978), the role of the public sector (Pleskovic and Trevino, 1985), and the impact of inter-sectoral linkages on (rural) poverty alleviation (Thorbecke, 1995; Khan, 1999).

In developed countries, SAMs at the national level have been used to analyse the effect of different taxation or subsidy schemes on income distribution (e.g. Roland-Holst and Sancho, (1992); Psaltopoulos et al., 2006). In addition, at present, much emphasis is put on environmental flows, instead of monetary flows. These SAMs are able to integrate, for example, physical water circular flows or emissions into the atmosphere by greenhouse gases (GE), together with the economic flows sourced from the National Accounting (see e.g. Morilla et al., 2007). Another example is the study of Sánchez-Chóliza et al. (2007). Their objective was to assess the environmental impact of the lifestyle enjoyed by the population of Spain; and to estimate the total and per capita pollution associated with household activity. The use of a SAM model facilitated the understanding of how the pollution associated with household activity and consumption patterns “circulates” throughout the map of an economy. The SAM accounts were expressed in terms of different kinds of pollution, such as waste water, NO_x, or CO_2.

Furthermore, examples can be found of applications at regional or town level. Most of them deal with towns in developing countries (see e.g. Adelman et al., 1988; Parikh and Thorbecke, 1996). Lewis (1991) describes a SAM application on town level of the Kenyan town Kutus. The SAM encompasses both the town of around 5,000 inhabitants, and the 8 km zone around it (hinterland) with a population of 42,000. The SAM was used to test the governmental assumption of agriculturally-driven regional economies and to evaluate non-agricultural production sector activities in the Kutus region. According to the Lewis’s multiplier analysis, agricultural activities were indeed very important for the stimulation of regional output and income.

The SAMs used in the present chapter are also developed spatially disaggregated levels, such as town-hinterland interactions. They are able to make a distinction between the town, a hinterland zone, and the rest of the world (ROW); they are typically interregional SAMs. They will be used to explore the relative economic importance of towns and hinterlands and to distinguish which sectors can be identified as key sectors.

Structure of a SAM table

A SAM can be described as a general equilibrium data system of income and expenditure accounts, linking production activities, factors of production, and institutions in an economy (Courtney et al., 2007).

Figure 1 shows the economic flows and interrelations captured by a SAM. The industrial production generates value added which is used to pay for primary inputs. These primary inputs consist of profits, wages, and payments to the government. Next, these incomes or receipts, generated in production, are handed over to households or the government. After a redistribution process, incomes are either used for (final) consumption or they are saved. The final consumption leads to new production by industries, and the whole process starts again.

From Figure 1 it becomes clear that input-output tables, which only focus on production linkages, ignore the effects arising from other linkages, as exist, for example, between households' income and the production sectors (final demand).

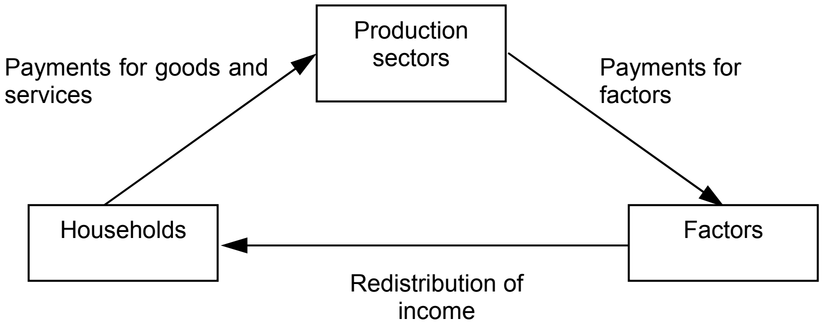

Figure 1: The direction of income flows between the three main types of accounts in a SAM.
Source: based on Roberts (2005).

Similar to an input-output table, a SAM presents a series of accounts together in one matrix. It contains a complete list of accounts describing income, expenditure, transfers and production flows (Cohen, 1989). In input-output models, usually only the production accounts are endogenous (implying that changes in the level of expenditures directly follow a change in income), and the factor and household accounts are exogenous (implying that expenditures are set independently of income changes). In a SAM, the production factors, as well as the households' accounts, are endogenous. The exogenous or independent accounts can consist of payments to, and receipts from, the government, actors outside the research area, and investments, value added or savings. Table 1 shows the elements of a (general) SAM.

The first account is the production accounts which are rather similar to an input-output table. The columns of the production accounts describe how firms buy raw materials and intermediate goods from other firms (A_{11}). Furthermore, a SAM includes information about the costs of hiring factor services (A_{21}) to produce commodities (Y'_1). The exogenous part of the first column includes expenditures in the ROW, and value-added, of which part is paid to the government. The rows, which show the receipts, describe the sales to domestic intermediate industries (A_{11}), to final consumption of households (A_{13}), and to exports to the ROW (X_1). The sales to firms or households in the ROW form the exogenous accounts.

Table 1: The elements of a SAM table

From / To		Endogenous accounts: Production	Endogenous accounts: Factors	Endogenous accounts: Households	Exogenous accounts	Total
Endogenous accounts	Production	A_{11}		A_{13}	X_1	Y_1
	Factors	A_{21}			X_2	Y_2
	Households		A_{32}		X_3	Y_3
Exogenous accounts		Residual balance*				
Total		Y'_1	Y'_2	Y'3		

* Used to meet the assumption that Y1= Y'1.
Source: Based on Cohen (1989).

The factor accounts include labour and capital accounts. The rows show received payments in the form of wages (A_{21}). Factor revenues, such as labour income and part of the profits, are distributed to households (A_{32}), after paying the corresponding taxes to the government. The exogenous part of the factor accounts includes payments to households in the ROW from town or hinterland industries, as well as wage payments of ROW industries to local households.

Finally, the households' accounts include the factor incomes described above (A_{32}), as well as household expenditures on the local market (A_{13}). The exogenous part (X_3) describes direct taxes and the savings from households, as well as their consumption in the ROW.

A SAM is balanced when savings is equal to receipts minus expenditure for all actors (firms and households). Because we do not have information about savings, we use the residual balance to make sure that the row and column sums are the same.

Advantages and disadvantages of SAM analysis

A SAM is an analytical and predictive tool to represent and forecast system-wise effects of changes in exogenous factors. A great advantage of a SAM is its ability to capture a wide variety of developments in a (macro-) economy, as it links production, factor and income accounts. A large share of economic interactions takes place within the household sector and a SAM disaggregates the cells involving 'returns for labour' and the household sector into smaller groups (such as different income groups) to show the effect of the different behaviour of these groups. Furthermore, it is a relatively efficient way of presenting data; the presentation of data in a SAM immediately shows the origin and destination of the various flows included. Another advantage is its usefulness as a tool to reconcile different data sources and fill in the gaps. This enables the reliability of existing data to be improved and inconsistencies in data sets of different nature and origin to be revealed (Alarcon et al., 1991).

Most of the disadvantages of a SAM are similar to the disadvantages of input-output tables and concern the production activities accounts. Important, and sometimes restrictive, assumptions made in the input-output model, as well as in the SAM, are that all firms in a given industry employ a constant production technology (usually assumed to be the national average of input, output and labour for that industry), and produce identical products. Because the tables are produced only for a certain period, the model can become irrelevant as a forecasting tool when production techniques change. Other disadvantages are that the model assumes that there are no economies or diseconomies of scale in production or factor substitution, and that they do not incorporate the existence of supply constraints. In a rather static situation, these ceteris paribus conditions are a perfectly acceptable position which has demonstrated its great relevance in a long (spatial-) economic research tradition. However, in a highly dynamic context, with complex space-time system interactions, stable solution trajectories are less likely to occur (Nijkamp, 2007). Finally, the production accounts are essentially based on a linear production technology; doubling the level of agricultural production will in turn double the inputs, the number of jobs, etc. This reveals something of the inflexibility of the model. Thus, the model is entirely demand-driven, implying that bottlenecks in the supply of inputs, or increasing efficiency effects are largely ignored (van Leeuwen et al., 2005).

There are also some practical problems in the development of a (local) SAM. The statistical estimation of a new matrix is very labour-intensive and expensive. This is mainly because much of the information is gathered with help of micro-survey questionnaires. A related problem with this method is that interviewees, firms, or households, are not able to give perfect answers. Sometimes they do not understand the question, or they do not want to tell the truth, and therefore -as a result of a response bias- the results are not always perfect. However, a SAM is still a very useful tool in that it shows effects throughout the whole economy, linking the different accounts.

A REGIONAL SAM

From a national to a regional model

The construction of a SAM always involves the integration of data from different data sets. Data required for production accounts often come from input-output tables (which are more widely available) and the distribution flows to institutions come from national income and expenditure accounts. Therefore, the majority of studies using SAMs concern the economies of single countries. Although an economic unit does not necessarily have to be a country, the national borders do provide a natural and artificial boundary for defining a macroeconomic unit (Round, 1988). Often information is available at the national level, which makes it a lot easier to develop a national input-output table or SAM. However, many economic processes on a regional level are very different from those at the national level. Regional, spatial or institutional differences can bring about important economic differences. Smaller regions, for example, are more dependent on trade with other areas, both for the sales of outputs (export) and for the purchase of inputs (import) (Miller and Blair, 1985). Therefore, it can be necessary to develop a regional SAM.

There are several ways to regionalize a national input-output table or a SAM. According to Isard et al. (1998), the more disaggregated a SAM needs to be, the more extensive are the data requirements. They state that the best way to build a regional SAM is to start with the regionalization of the production activities' account using a national input-output table. The simplest way is to use a 'non-survey method'. Another way is to use the GRIT method:

Generating Regionalized Input-output Tables. The GRIT method, developed by Jensen et al. (1979), has the advantage that it combines non-survey methods with survey methods. The GRIT system is designed to produce regional tables that are consistent in accounting terms with each other and with the national table. Therefore it uses location quotients, which describe the regional importance of an industry compared with its national importance, by using output-ratios. However, the developer is able to determine the extent of interference with the statistical processes by introducing primary (e.g. from questionnaires) or other superior regional data. In the next section we will describe the development of SAMs at the local, town-hinterland level.

Interregional SAMs at town-hinterland level

Data collection

For our study, we used data that was collected as part of a trans-national project, the European Union research project 'Marketowns'[1]. This project focused on the role of small and medium-sized towns as growth poles in regional economic development. For this purpose, it was necessary to measure the flow of goods, services and labour between firms and households in a sample of 30 small and medium-sized rural towns in five EU countries. The participating countries reflect the varied conditions of the existing and enlarged European Union, viz. France, Poland, Portugal, the Netherlands and the UK. In each of the participating countries, six small and medium-sized towns were selected with reference to a set of relevant, predefined criteria: for instance, the condition that no other town with more than 3,000 inhabitants should be located in a hinterland with a radius of approximately 7 km.

In order to compare the nature and strength of linkages throughout the wider economy, we defined three different zones for each town: town, hinterland and the rest of the world (ROW). These were designed to facilitate comparisons between the different areas. As a result, the study area from which households and firms were sampled comprised the town and the hinterland, a 7 km radius around it.

Primary data were collected using self-completion survey techniques to measure the spatial economic behaviour of households and firms. The household questionnaire focused on spatial patterns of consumer purchases by distinguishing between different categories of goods and services and expenditure patterns across the three pre-defined geographical zones. Furthermore the place of work was identified. The firm questionnaire dealt with spatial patterns of input and output transactions, including labour costs. Surveys were carried out between September 2002 and May 2003 (Terluin et al, 2003).

Developing an interregional SAM

A specific classification and disaggregation of a SAM depends on the questions which the SAM methodology is expected to answer. In this case, the aim is to focus on the spatial interdependency of town and hinterland actors (see also Mayfield et al., 2005). This means that a bi-regional SAM has to be developed, describing both the town and its hinterland, which results in four systems of endogenous accounts (see also Appendix A.II):

Linkages within the town;

[1] The information contained in this chapter is drawn from the MARKETOWNS project funded by the European Commission under the Fifth Framework Programme for Research and Technology Development, Contract QLRT -2000-01923. The project involves the collaboration of the University of Reading (UK), the University of Plymouth (UK), the Joint Research Unit INRA-ENESAD (France), Agricultural Economics Research Institute LEI (The Netherlands), the Polish Academy of Sciences (Poland) and the University of Trás-os-Montes and Alto Douro (Portugal).

Linkages within the hinterland;
Flows from town to hinterland;
Flows from hinterland to town.

For the generation of the interregional SAM, the most important data are the national input-output table and secondary data, such as number of firms or number of jobs, obtained from government institutions, as well as primary data from (local) surveys (see Figure 2). When this information has been collected, the next step is to develop a regional input-output table by the use of the earlier described GRIT method. The GRIT method uses location quotients, which describe the regional importance of an industry compared with its national importance, by using output-ratios. Together with additional secondary data on commuting patterns and on production values, value added, employment level, savings, investments, imports, and exports, a regional input-output table describing the town and a table describing the hinterland can be generated.

As mentioned earlier, the most structural difference between a (regional) input-output table and a (regional) SAM is the information on household expenditures, wages, employment, etc. Therefore, secondary data, together with information from the surveys on household groups and firm groups, need to be added and combined with the two regional input-output tables. After the regional SAM has been generated, expert opinions[2] can be requested to verify the cell values of the matrix.

Although, the development of the SAMs should take place with great care, it is important to keep in mind that the local focus of the models that have been built results in its own limitations. One of the major problems is the relatively small proportion of the total inputs and outputs from firm production that is retained within the local economy, resulting in small coefficients, making them more liable to statistical error. Another limitation is that the secondary data collected in the five countries (especially in Portugal and Poland) is not exactly the same (sometimes there was even no data available at all) (Mayfield et al., 2005), resulting in various creative solutions.

However, finally, 30 SAMs were developed (see Appendix A.1 for a list of towns), each consisting of 17 production accounts, 4 production factor accounts, 4 household accounts and an exogenous ROW account (see Appendix A.III). Together, they form a very interesting and unique database, especially because they enable us to perform a thorough analysis and comparison of the economic structure of a set of towns located in five different European countries.

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[2] In this case, local stakeholders (policy makers and persons who are acquainted with the local economy) were asked to verify the results.

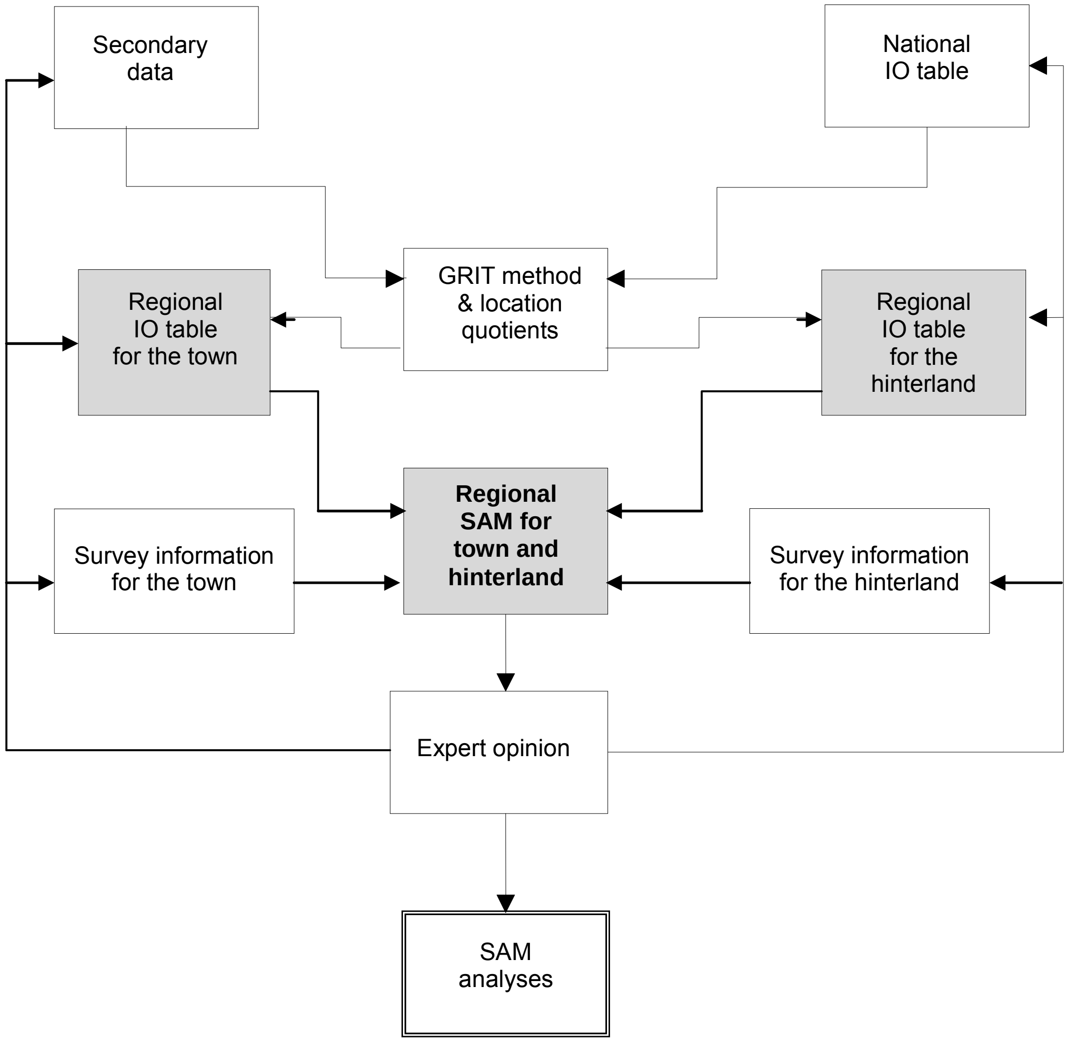

Figure 2: Procedure to construct interregional SAMs (source: Mayfield et al. (2005))

MULTIPLIER ANALYSIS

Introduction

SAMs, as I-O tables, can be used to construct multipliers based on the estimated re-circulation of spending within the region: recipients use some of their income for consumption spending, which then results in further income and employment. This 'multiplier effect' appears at three levels. First, the *direct effect* of (production) changes: for example, an increase in retail demand because of a growing population will directly increase the output of the retail industry. *Indirect effects* result from various rounds of the re-spending of, for example, retail receipts in linked industries, such as the wholesale or the food sector. This will have an indirect effect on these industries. The third level of effects is the *induced effect.* This effect only occurs when the household accounts are endogenous (which means that it responds to a change in income) as in a SAM. The induced effects include changes in economic activity resulting from household spending of income earned directly or indirectly. These households can, for example, be employees of supermarkets, who spend their income in the local economy (van Leeuwen et al., 2005).

The three most frequently used types of multipliers are those that estimate the effects on: (1) outputs of the industries; (2) income earned by households because of new outputs; and (3) employment generated because of the new outputs. In this section, we look at the composition of those multipliers and identify important sectors for the town and hinterland economy.

Variations in multiplier values in the literature

The values of the multipliers can differ because of different factors. The size of the multipliers depends, first of all, on the choice of the exogenous and endogenous variables which, in turn, depend on the problem studied (Cohen, 1999). Furthermore, the size depends on the overall size and economic diversity of the region's economy. Regions with large, diversified economies which produce many goods and services will have high multipliers, as households and businesses can find most of the goods and services they need in their own region. Smaller regions, such as cities or towns, will need to import more products and labour (imports can be considered as leakage), resulting in lower multipliers. Regions that serve as central places for the surrounding area will have higher multipliers than more isolated areas. Besides this, the level of economic development is important. Economic theory predicts a higher share of government and more foreign trade at higher levels of economic development, leading to an expected lower output multiplier at a higher development level (Cohen, 1999). Furthermore, the nature of the specific industries concerned can have a significant effect. Multipliers vary across different industries of the economy based on the mix of labour and other inputs and the tendency of each industry to buy goods and services from within the region (less leakage to other regions) (van Leeuwen et al., 2005).

The value of SAM multipliers is higher compared with input-output multipliers because, besides capturing effects from production activities, they also include effects on factor and household incomes. The range of values of SAM output multipliers on a national scale lies between 2.1 and 4.5 (see Vogel, 1994; Blane, 1991; Cohen, 1999; Archarya, 2007). As expected, SAM output multipliers at a local or regional scale are usually lower, and have values between 1.3 and 2.3 (see Roberts, 1998; Cohen, 1996; Psaltopoulos et al., 2006). The income multipliers are generally lower compared with output multipliers: at a local scale the values typically range between 1.2 and 1.6.

INTERREGIONAL SAM MULTIPLIERS AT TOWN-HINTERLAND LEVEL

As described earlier, the town-hinterland SAMs include four systems of endogenous accounts: town-town, hinterland-hinterland, town-hinterland, and hinterland-town flows. The total SAM multiplier is a product of three matrixes: M1, M2 and M3 (see Mayfield et al., 2005). First of all, M1 is the intraregional multiplier matrix, depicting the linkage effects between endogenous accounts wholly within the actors' 'own region' (town or hinterland). Secondly, M2 can be interpreted as the multipliers for all the cross-flows between the town and hinterland. It captures the effects from the town on the hinterland, and vice versa. Thirdly, M3 indicates the 'closed loop' multiplier matrix. This matrix shows the effect that a shock in the town (or hinterland) has on itself through the endogenously defined linkages within the hinterland (or town).

Table 2 shows the M1 and M2 multipliers for a shock in the production sector, factor accounts, or household income.

Table 2: M1 and M2 output multipliers for town and hinterland (shock to production, factors, or household income)

<table>
<tr><td></td><td></td><td>Production</td><td>Factor</td><td>Household</td><td>Production</td><td>Factor</td><td>Household</td></tr>
<tr><td></td><td></td><td colspan="3">Town</td><td colspan="3">Hinterland</td></tr>
<tr><td>Production</td><td rowspan="3">Town</td><td rowspan="3">$M1_{town}$ (output)</td><td rowspan="3">$M1_{town}$ (factor)</td><td rowspan="3">$M1_{town\ (income)}$</td><td rowspan="3">$M2_{hinterland}$ (output)</td><td rowspan="3">$M2_{hinterland}$ (factor)</td><td rowspan="3">$M2_{hinterland}$ (income)</td></tr>
<tr><td>Factor</td></tr>
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<tr><td></td><td></td><td colspan="3">Town</td><td colspan="3">Hinterland</td></tr>
<tr><td>Production</td><td rowspan="3">Hinterland</td><td rowspan="3">$M2_{town}$ (output)</td><td rowspan="3">$M2_{town\ (factor)}$</td><td rowspan="3">$M2_{town\ (income)}$</td><td rowspan="3">$M1_{hinterland}$ (output)</td><td rowspan="3">$M1_{hinterland}$ (factor)</td><td rowspan="3">$M1_{hinterland}$ (income)</td></tr>
<tr><td>Factor</td></tr>
<tr><td>Household</td></tr>
</table>

Evidently, this methodology results in a great number of (sub-) multipliers (output, factor, and income) as well as the possibilities to show linkages between town and hinterland. Our aim is to use the interregional SAMs to find out, for towns in 5 European countries, what important sectors in both town and hinterland economies are, and how strong are the linkages between production and households and between town and hinterland.

SAM income multipliers

SAM household income multipliers (summation of the M_1, M_2 and M_3 effects) reflect the impact on the regional economy of a shock into household incomes. In the interregional SAMs, the households are divided into four income groups (25 per cent groups). Income group 1 receives the least income, income group 4 the most. The exact amount of income per household group differs between the five countries because the division is based on the average level of income in a specific country.

Table 3 shows the average SAM income multipliers per country, and Table 4 the average value for the 4 different income groups per country. From the literature, we know that the values of income multipliers are generally lower compared with output multipliers. For England, France and the Netherlands, Table 3 shows values in line with values found in the literature (between 1.2 and 1.6). However, in Portugal and Poland, the values are higher, even 2.11 for the low incomes in the Polish towns. From the data, it appears that particularly the Polish and Portuguese (town) households buy a large amount of necessities in the local economy. Furthermore, more than two-thirds of these households have a job in the zone of residence, which means that they also profit from the induced effects. The reason why there is a higher income multiplier for the town households is that, in all countries, these households buy more products and services locally.

Table 3: Average household income multipliers in town and hinterland for 5 European countries

	England	France	Netherlands	Poland	Portugal	Average
Town	1.30	1.44	1.39	1.58	1.71	1.48
Hinterland	1.28	1.35	1.35	1.48	1.69	1.43

Table 4: SAM Household income multipliers in town and hinterland for 5 European countries

	England	France	Netherlands	Poland	Portugal	Average
Town						
Income group 1	1.40	1.63	1.57	2.11	1.78	1.70
Income group 2	1.34	1.50	1.44	1.56	1.97	1.56
Income group 3	1.28	1.30	1.30	1.23	1.70	1.36
Income group 4	1.18	1.31	1.22	1.41	1.39	1.30
Hinterland						
Income group 1	1.40	1.37	1.59	1.83	1.83	1.60
Income group 2	1.30	1.47	1.36	1.76	1.79	1.53
Income group 3	1.26	1.31	1.27	1.24	1.77	1.37
Income group 4	1.18	1.27	1.17	1.07	1.37	1.21

Interestingly, from Table 4 it appears that, in all countries, both in town and hinterland, the lower the income, the higher the multiplier effect. Households with high income more often have a job outside the local area (outside the town-hinterland area). Furthermore, it appears that richer households are less likely to shop in town or hinterland.

Summarizing, it appears that especially in Poland and Portugal the household income multipliers are relatively high. This is mainly because of strong effects on the production output. Furthermore, we can conclude that the higher the level of income of households, the lower the SAM income multiplier. Finally we found that, in general, most of the impact of a shock to the income of households, living either in town or hinterland, goes to town production output. The only exception is the Netherlands where a shock to the income of hinterland households also results in a strong effect on the production output in the hinterland.

SAM output multipliers

SAM output multipliers show the adjustment in the towns' and hinterlands' total output that would be associated with a change of one unit of output from a certain sector. When, for example, the final demand for manufacturing products increases in towns, this results in an effect in the production sectors in towns, as well as in the production sectors in the hinterlands. But these are not the only effects: there will also be an effect in labour factors, as well as in household incomes in town and hinterland. All these effects together, plus the 'closed loop' effect[3] sum up to the 'industry SAM output multiplier'.

Aggregated output multipliers

For each town, the output multiplier of 17 sectors in the town and hinterland has been derived. Table 5 shows the average SAM output multiplier values of the aggregated agricultural, manufacturing and service related sectors per country (average of 6 towns). First of all, we can see that the hinterland multipliers have higher values than the town multipliers. In many areas, the total economic output in town is larger than in the hinterland. Furthermore, it appears that local inputs are more important for hinterland firms (higher indirect effects). The service multipliers have relatively high values; only in England, is the

[3] For example, the effect of hinterland households who receive more income because of a shock to the town and who spend this extra income in a shop in town.

output multiplier for the manufacturing sector in town higher than the service multiplier. The explanation for this is that in England (and to a lesser extent in France), the share of exogenous accounts in the total output of the manufacturing sectors is lower than for the service sectors[4]. Especially in the Netherlands and Portugal, the multiplier for the service sector is relatively high (both in the town and the hinterland). The most important reason for this is the stronger effect on factor income and household income in the Netherlands; in Portugal, a stronger effect on the intermediary deliveries also plays a role.

Table 5: Aggregated SAM output multipliers for five European countries

	England	France	Netherlands	Poland	Portugal	Average**
Town						
Agriculture*	-	-	-	-	-	-
Manufacturing	1.39	1.36	1.29	1.26	1.20	1.30
Services	1.32	1.41	1.56	1.45	1.51	1.45
Hinterland						
Agriculture***	1.25	1.28	1.52	1.94	1.65	1.53
Manufacturing	1.42	1.30	1.35	1.35	1.52	1.39
Services	1.44	1.44	1.57	1.50	1.66	1.52

* Agriculture is not part of the town economy.
** Average of the five country multipliers.
*** Without forestry and fishing.

In Poland and Portugal, the agriculture multipliers are relatively high. Especially in Poland this sector is still important; it produces 31 per cent of the total output of the Polish hinterland compared with around 12 per cent in the other four countries (see van Leeuwen, 2008). However, also in Portugal and the Netherlands, the agriculture multipliers are larger than the manufacturing multipliers. This can be explained by the relatively large share of local inputs.

The hinterland multipliers are generally higher and more heterogeneous compared with the town multipliers. This holds especially for Poland and Portugal. In Poland the effect on factor income is stronger in the hinterland. In Portugal, the main reason for higher multipliers in the hinterland is the stronger interregional effect on production activities located in the town.

Sectors with high multiplier values

After this general exploration of multiplier values in the five countries, we can focus more on sectors with relatively high multipliers, for the town and hinterland economy. Table 6 shows the disaggregated SAM output multipliers for 13 sectors in the towns (in a town the agricultural sectors are usually not present) and 17 sectors in the hinterland.

Table 6: SAM output multipliers for sectors in town and hinterland in 5 European countries

[4] In the other three countries, the share of exogenous accounts (which includes payments to the ROW) in the service sectors is lower compared with those in the manufacturing sectors, resulting in higher service multipliers. However, in general, the share of exogenous accounts is very high in England and France (around 82 per cent) compared with the other three countries (70 per cent in the Netherlands and Poland and 65 per cent in Portugal).

	England	France	Netherlands	Poland	Portugal	Average
Town						
Arable farming*	-	-	-	-	-	-
Dairy and intensive farming	-	-	-	-	-	-
Horticulture	-	-	-	-	-	-
Mixed farming	-	-	-	-	-	-
Forestry and fishing	1.39	1.00	1.00	1.23	1.47	1.22
Coal, oil and gas, metal ore, electricity	1.48	1.37	1.00	1.10	1.01	1.19
Food, drink and tobacco	1.34	1.44	1.22	1.22	1.06	1.26
Textiles, leather, wood, furniture	1.48	1.36	1.36	1.24	1.21	1.33
Chemicals, rubber, plastics, glass	1.43	1.44	1.19	1.38	1.10	1.31
Metals, machinery, electrical, computing, transport equipments	1.46	1.31	1.33	1.25	1.25	1.32
Construction	1.13	1.27	1.64	1.38	1.57	1.40
Transport Services	1.36	1.66	1.55	1.55	1.31	1.48
wholesale/retail	1.10	1.34	1.58	1.51	1.27	1.36
Hotels and catering	1.19	1.62	1.89	1.55	1.78	1.61
Banking and financial services	2.12	1.61	1.43	1.19	1.24	1.52
Other Business services	1.02	1.07	1.31	1.28	1.56	1.25
public administration, education, health, other services	1.14	1.16	1.61	1.65	1.92	1.50
Hinterland						
Arable farming	1.27	1.13	1.48	1.76	1.89	1.51
Dairy and intensive farming	1.22	1.17	1.73	1.81	1.74	1.53
Horticulture	1.11	1.64	1.45	1.83	1.89	1.58
Mixed farming	1.40	1.19	1.41	2.37	1.07	1.49
Forestry and fishing	1.08	1.00	1.18	1.36	1.62	1.25
Coal, oil and gas, metal ore, electricity	1.44	1.29	1.06	1.13	1.33	1.25
Food, drink and tobacco	1.43	1.42	1.44	1.62	1.36	1.45
Textiles, leather, wood, furniture	1.43	1.40	1.58	1.36	1.68	1.49
Chemicals, rubber, plastics, glass	1.47	1.16	1.36	1.17	1.45	1.32
Metals, machinery, electrical, computing, transport equipments	1.55	1.22	1.29	1.46	1.45	1.39
Construction	1.17	1.32	1.40	1.35	1.87	1.42
Transport Services	1.29	1.60	1.47	1.67	1.79	1.57
wholesale/retail	1.31	1.31	1.51	1.39	1.30	1.36
Hotels and catering	1.15	1.54	1.81	1.57	1.86	1.59
Banking and financial services	2.44	1.65	1.44	1.60	1.28	1.68
Other Business services	1.20	1.39	1.47	1.30	1.85	1.44
public administration, education, health, other services	1.27	1.14	1.72	1.49	1.88	1.50

* Agriculture is not part of the town economy

First we focus on multipliers of sectors located in town. From Table 6, it becomes clear that in the English towns the industry sectors have higher multiplier values than in the other countries; an exception is the construction sector. However, the banking and financial service sector has the highest multiplier, with a value of 2.12. This is due to strong linkages with ‘other services’ and public administration. Also an important part of the multiplier is related to wages paid to managers and (non) skilled non-manual employees.

The French towns show a rather similar picture; with relatively high industry multipliers (compared to the other countries). However, here the transport sector has the highest multiplier of the towns, together with hotels and catering and (again) the banking and financial services sector.

In the Netherlands, the situation is slightly different. From the industry sectors, especially the construction sector seems to be important, with the highest multiplier for this sector of all five countries. This also holds for the hotels and catering service sector, with a high multiplier of 1.89. This last sector has a relatively strong impact on the income of local households.

Other important service sectors in the Dutch towns are wholesale and retail, as well as public administration. In Poland and Portugal the key-sectors are rather similar to those of the Dutch towns: the construction sector has the highest multiplier value of the industry sectors and the hotels and catering and the public administration sector are important service sectors.

On average, in the towns of the five European countries, the construction sector is the key-industry sector and the hotels and catering the key-service sector; the sectors with the greatest output impact on the local economy from an exogenous shock. These sectors, together with the agricultural sectors and public administration, also have the strongest impact on local household income.

Secondly, we look at the hinterland sectors. We already saw that the agriculture sector in general can have high multiplier values, especially in Poland and Portugal and to a lesser extent in the Netherlands (see Table 2). According to Table 3, in Poland the agricultural sector with the highest multiplier is mixed farming with a value of 2.37. In Portugal, the horticulture and arable farming have the highest multipliers. This is because of strong effects on both factor income as well as on the household income accounts. Horticulture is also in France, by far, the most important agriculture sector, with a multiplier of 1.64. Also here, strong linkages exist with factor income as well as with deliveries of the arable farming sector. In the Netherlands, the agricultural sector with the highest SAM multiplier is the dairy and intensive farming sector. In these hinterland areas, the intermediate deliveries affect the multiplier, deliveries to the own sector, the energy sector, for machinery or public administration.

Furthermore, in the hinterland, not the construction sector but the 'textiles, leather, wood and furniture' sector has on average the highest multiplier, especially in the Netherlands and Portugal. Another important sector is the 'food, drink and tobacco' sector, with especially a high value in Poland. Also in France, this is an important industry sector.
The service sector with on average the highest SAM output multiplier is the banking and financial services sector; especially in England and France this is the key-service sector. Another important sector in the hinterland as well, is the hotel and catering sector.

To summarise, we found that in general, in all five countries, both in town and hinterland, the sectors with the highest multiplier values are the service-related sectors. In England and France this is the banking and financial service sector, in Poland (and also in France) the transport sector, and in the Netherlands and Portugal this is the hotel and catering, as well as the public administration sector.

Inter-regional effects
Apart from level of redistributive effects (size of the multiplier), multipliers can also show the interdependencies between town and hinterland. The inter-regional effects, obtained through the M_2 multiplier, show the linkages between town and hinterland and how strong they are; is the town more dependent on the hinterland, or the hinterland on the town?

Table 7 shows which part of the (redistributive) multiplier effect descends in the other region because of a shock in production activities in the town or hinterland, thus showing the level of interdependency. The inter-regional effects are calculated by dividing the effect of a shock in output in the 'other' region by the total effect from the shock minus the initial shock. When the total output multiplier is 1.58 and the effect in the 'other' region 0.19, the intra-regional effect is 0.19/0.58*100.

It appears that, on average, the inter-regional effect in the hinterland of a shock in the town is around 22 per cent (both for industry as for services). The largest effects appear in the textiles and in the banking sectors in the Netherlands (both 36 per cent); the smallest effects appear in England and Poland. In these two countries the towns are less dependent on the hinterland.

When focussing on the effects in town from a shock in the hinterland, we see that the shares are almost always higher, only in the Netherlands, the hotel and the construction sector in the hinterland are less connected to the town than vice versa. For the hinterland, the linkage with the town is between 30 and 39 per cent. This implies that, in general, the hinterland is more connected to the towns and thus more dependent of intermediary deliveries as well as from labour form the towns.

In the agricultural sectors the linkages seem to be slightly weaker; however, in the Netherlands the horticulture sector depends for 56 per cent of the town, both for intermediate deliveries and for labour. In the industrial sectors, on average the strongest inter-relationships exist; 39 per cent of the multiplier effect. In France the strongest linkage exists in the construction sector. These construction firms in the hinterland are especially dependent on the intermediary deliveries of the towns. Finally, the interregional effects in the service sector are the highest in Portugal, especially in the hotel sector. Also in Poland and England the interregional relationship is strong in this sector. In Poland and Portugal, almost all necessary goods and services are bought in town; apparently these are not available in the hinterland. In England also part of the factor income is paid to town households. The linkage between town and hinterland in the banking sector seems to be very strong in the Netherlands. Besides there dependency on intermediary deliveries, also labour is acquired from the towns.

Table 7: Inter-regional effects of aggregated and key-sectors: effect in the hinterland from a shock in output in town and vice versa.

	England	France	Netherlands	Poland	Portugal	Average
Effect on hinterland from a shock in town			%			
Agriculture*	-	-	-	-	-	-

Dairy and intensive	-	-	-	-	-	-
Horticulture	-	-	-	-	-	-
Industry	13	24	26	18	27	22
Textiles	15	20	36	21	28	24
Construction	12	17	28	18	25	20
Services	18	23	25	17	20	21
Hotels	17	16	24	9	23	18
Banking	16	27	36	18	20	24
Effect on town from a shock in the hinterland			%			
Agriculture	24	36	38	28	24	30
Dairy and intensive	29	40	32	25	29	31
Horticulture	16	36	56	41	25	35
Industry	18	29	54	47	49	39
Textiles	15	23	60	44	39	36
Construction	39	44	20	33	41	36
Services	30	42	29	37	39	35
Hotels	42	26	16	43	42	34
Banking	23	40	49	32	31	35

* Agriculture is not part of the town economy

To summarise, it appears that in general the interrelationships between hinterland and town is stronger than vice versa. Although the differences between the sectors are very small, on average the strongest links are found in the industry sectors, both in town and hinterland. Furthermore, the strongest links are found in Netherlands, because of intermediary deliveries, but mostly because of labour. In Poland and Portugal the hinterland is especially dependent of intermediary deliveries from the towns. In England we find the weakest links.

SAM employment multipliers

The employment multipliers indicate the additional employment generated in the regional employment due to an initial employment increase in a particular sector. The employment multipliers are derived from a combination of output multipliers and direct employment coefficients (employment per sector output), see Mayfield et al., 2005, p. 57).

Table 8 shows the aggregated multipliers for the agricultural, industrial and service related sectors in the five countries. The multiplier values are far more homogeneous compared to the output and household income multipliers: they range between 1.10 and 1.36. On average, the employment multipliers for the town and hinterland sectors seem to be equal in size. Furthermore it appears that, in both areas, the industrial sectors generate the largest effects in employment when a new job is added. In the agricultural sectors the effect is relatively small.

Table 8: Aggregated SAM employment multipliers for 5 European countries

	England	France	Netherlands	Poland	Portugal	Average**
Town						
Agriculture*	-	-	-	-	-	-

Industry	1.32	1.33	1.27	1.14	1.16	1.24
Services	1.31	1.17	1.12	1.11	1.21	1.19
Hinterland						
Agriculture***	1.11	1.07	1.18	1.11	1.10	1.11
Industry	1.36	1.26	1.18	1.12	1.23	1.23
Services	1.32	1.20	1.09	1.10	1.24	1.19

* Agriculture is not part of the town economy ** Average of the five country multipliers *** Without forestry and fishing

Although, both the output and the income multipliers for the English and French towns are relatively small, the employment multipliers are rather large. Moreover, particularly the Polish employment multipliers are relatively small. This can be explained by the fact that both in England and France, the local number of jobs (per household) is rather small, thus an increase of 1 job has a stronger effect. On the other hand, in Poland, the number of jobs is rather large.

Important employment sectors

Table 9 shows the disaggregated employment multipliers of the sectors with the largest employment multipliers, as well as the sectors that have high output multipliers. Interestingly, some of the sectors have both high output and employment multipliers. This holds for dairy and intensive farming and for banking and financial services. However, other sectors with high output multipliers, such as horticulture, construction and hotel and catering, do not have high employment multipliers, possibly because these sectors are already labour intensive. In all countries, the food, drink and tobacco sector, as well as the banking and financial services sector have relatively high employment multipliers.

Table 9: Disaggregated SAM employment multipliers of the key-output sectors and the sectors with the highest employment multiplier

	England	France	Netherlands	Poland	Portugal	Average
Town						

Dairy and intensive farming*	-	-	-	-	-	-
Mixed farming	-	-	-	-	-	-
Horticulture	-	-	-	-	-	-
Food, drink and tobacco	1.41	1.34	1.29	1.18	1.09	1.26
Metals, machinery, electrical, computing, transport equipments	1.32	1.36	1.29	1.10	1.37	1.29
Construction	1.09	1.11	1.22	1.19	1.17	1.16
Transport Services	1.48	1.34	1.22	1.10	1.21	1.27
Hotels and catering	1.09	1.08	1.12	1.15	1.12	1.11
Banking and financial services	2.09	1.37	1.28	1.12	1.19	1.41
Hinterland						
Dairy and intensive farming	1.03	1.10	1.28	1.12	1.15	1.14
Mixed farming	1.28	1.06	1.21	1.06	1.04	1.13
Horticulture	1.06	1.07	1.09	1.06	1.14	1.08
Food, drink and tobacco	1.59	1.54	1.43	1.14	1.25	1.39
Metals, machinery, electrical, computing, transport equipments	1.41	1.13	1.12	1.06	1.28	1.20
Construction	1.13	1.09	1.10	1.07	1.21	1.12
Transport Services	1.17	1.29	1.11	1.11	1.39	1.21
Hotels and catering	1.05	1.16	1.05	1.13	1.14	1.11
Banking and financial services	2.21	1.49	1.18	1.10	1.09	1.41

* Agriculture is not part of the town economy

Inter-regional effects

The level of inter-regional effects of a shock in employment is quite comparable to the effects of a shock in production output; in town the interregional effects are around 20 per cent, in the hinterland around 35 per cent (see Table 10).

Table 10: Inter-regional effects of aggregated and key-sectors: effect in the hinterland from shock in employment in town and vice versa.

	England	France	Netherlands	Poland	Portugal	Average
Effect on the hinterland from a shock in town			%			%
Agriculture*	-	-	-	-	-	-
Dairy and intensive farming	-	-	-	-	-	-
Mixed farming	-	-	-	-	-	-
Industry	10	18	26	16	21	18
Food, drink and tobacco	19	30	26	18	32	23
Metals, machinery…	3	21	44	19	19	22
Services	13	15	31	12	14	18
Transport Services	13	10	22	11	10	14
Banking and financial services	11	18	49	7	14	21
Effect on town from a shock in the hinterland			%			%
Agriculture	12	20	34	41	43	26
Dairy and intensive farming	20	32	32	27	42	28
Mixed farming	29	27	33	39	22	32
Industry	9	27	63	57	59	39
Food, drink and tobacco	2	16	68	49	49	34
Metals, machinery…	4	39	49	70	57	40
Services	20	38	44	55	61	39
Transport Services	18	16	44	59	37	34
Banking and financial services	12	30	59	49	54	38

* Agriculture is not part of the town economy

Although the English and French employment multipliers are relatively high compared to the other countries, still the linkages between town and hinterland are relatively small. In the Netherlands, these effects are much stronger: especially the town-hinterland linkages are strong compared to the other countries; with almost half of the impact of a new job in the banking and financial service sector in town affecting the hinterland. However, the strongest linkages appear between hinterland and town, both in the service and industry sectors in most countries.

CONCLUSIONS

This chapter has focused on the different possible applications of SAMs. After a conceptual exposition, various results derived from 30 interregional (town and hinterland) SAMs in 5 European countries were presented. The aim was to find out in which countries strong linkages, and thus high multiplier values, appear, what are sectors with large redistributive effects on town and hinterland economies and to what extent are town and hinterland linked.

As well as analytical results, the SAM analysis also generates multipliers which can be used as a more predictive tool. Multipliers show the system-wide direct and indirect effect of the recirculation of spending within the region; recipients use some of their income for consumption spending, which then results in further income and employment, and so forth.

Obviously, households are also part of the macro-economy. In Poland and Portugal, the income multipliers are significantly higher than in the other three countries. This is because Polish and Portuguese (town) households buy a large amount of necessities in the local economy. Furthermore, more than two-thirds of these households have a job in the local area, which means that they also profit from the induced effects.

In all countries, we found a higher multiplier for town-households than for hinterland households. The explanation for this is that, in all countries, these town households buy more products and services locally. Furthermore, it appears that both in town and hinterland, the lower the income, the higher the multiplier.

We also found that, in general, the highest output (measuring the effect of extra demand in output) and income (measuring the effect of increasing income) multipliers are found in Poland and Portugal. In these countries, strong linkages exist between local production activities, as well as between households and local production. This is an indication that in less developed countries rural areas are still relatively isolated, leading to smaller leakages in rural economies. In England and France, the multipliers are relatively low, and in the Netherlands in-between. In all five countries, the service-related sectors generate the highest output multipliers. Only in the English towns (not in the hinterland) are the manufacturing multipliers higher, and in the Polish hinterland the agriculture multipliers.

Furthermore, the hinterland multipliers are in general higher than the town multipliers. An important reason for this is the stronger linkage between hinterland and town than vice versa: the hinterland firms obtain a relatively larger part of their inputs from the towns. This implies that investments (or subsidies) in hinterland activities, preferably in service-related activities, leads to relatively large local effects.

We also find that there are significant national differences. In England, and to a lesser extent in France, the linkage between town and hinterland is weaker, as well as the production-income linkage; these firms have more employees from outside the local area. In the Netherlands, the linkages between town and hinterland are much stronger but the towns are relatively less important. However, both town and hinterland are especially important for the provision of labour.

We may conclude that SAMs are a powerful tool in (spatial-) economic research, as they are able to map out the complexities of intersectoral and interregional interactions in a manageable format, based on a strict economic methodology. Their wide-spread use illustrates that the use of SAMs greatly enhances an understanding of impacts of shocks or interactions in (multi) regional systems, and hence may be seen as important vehicles for a solid policy analysis.

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Appendix A.I: List of European towns included in the analysis together with information about the population in town, hinterland and the total area, as well as the number of jobs in the total area.

Country	Town	Population (# inhabitants)			# Jobs
	Location	Town	Hinterland	Total	Total
England	Leominster	7,316	6,147	13,463	4,964
	Swanage	8,571	3,667	12,238	3,741
	Towcester	6,771	13,949	20,720	6,507
	Tiverton	9,257	8,582	17,838	6,781
	Burnham-on-Sea	16,344	14,909	31,253	8,925
	Saffron Walden	10,331	22,564	32,895	23,168
France	Brioude	3,131	1,969	5,100	5,771
	Prades	3,632	1,352	4,984	3,170
	Magny-en-Vexin	2,296	1,994	4,290	3,573
	Mayenne	6,548	2,428	8,976	11,177
	Douarnenez	7,302	1,615	8,917	7,601
	Ballancourt-sur-Essonne	6,169	10,900	17,069	10,990
The Netherlands	Dalfsen	6,570	16,895	23,465	6,791
	Bolsward	9,378	18,555	27,933	9,184
	Oudewater	7,745	51,705	59,450	30,576
	Schagen	17,214	24,116	41,330	13,198
	Nunspeet	19,215	27,410	46,625	17,630
	Gemert	14,815	41,245	56,060	17,119
Poland	Glogówek	6,251	12,975	19,226	5,214
	Duzniki	5,471	1,846	7,317	4,728
	Ożarów	7,144	16,956	24,100	7,694
	Jędrzejów	16,667	9,076	25,743	16,354
	Ultsroń	14,585	6,632	21,217	10,554
	Lask	20,587	11,104	31,691	8,018
Portugal	Mirandela	11,186	14,633	25,819	9,148
	Tavira	12576	12,421	24,997	10,221
	Lixa	5490	52,105	57,595	27,790
	Vila Real	32,644	17,313	49,957	20,511
	Silves	18,836	14,994	33,830	14,945
	Esposende	10,401	22,924	33,325	15,531

Appendix A.II: Format of inter-regional Marketowns SAM (53 x 53)

	Town			Hinterland				
Town	Production	Production labour income	Households	Production	Production labour income	Households	Exogenous accounts	Total
Production	*A1* Town inter-industry matrix	**B1**	C1 Town household expenditures on town goods and services (g&s)	*D1* Exports from town sector output to hinterland	**E1**	F1 Hinterland household expenditures on town (g&s)	G1 Export from town sector output to ROW, ROW household consumption on town g&s	*H1* Total output value of town production
Production labour income	A2 Wage payments by town sector output to town labour income	B2	C2	D2 Wage payments by hinterland sector output to town labour income	E2	F2	G2 Wage payments by ROW sector output to town labour income	H2 Total factor payments to town
Households	A3	B3 Payments to town households from town sector output	C3	D3	E3 Payments to town households from hinterland sector output	F3	G3 Government transfers to town households	H3 Total town households income
Hinterland								
Production	A4 Export from hinterland sector output to town	B4	C4 Town household expenditures on hinterland (g&s)	D4 Hinterland inter-industry matrix	E4	F4 Hinterland household expenditures on hinterland (g&s)	G4 Export from hinterland sector output to ROW, ROW household consumption on hinterland g&s	H4 Total output value of hinterland production
Production labour income	A5 Wage payments by town sector output to hinterland labour income	B5	C5	D5 Wage payments by hinterland sector output to hinterland labour income	E5	F5	G5 Wage payments by ROW sector output to hinterland labour income	H5 Total factor payments to hinterland
Households	A6	B6 Payments to hinterland households from town sector output	C6	D6	E6 Payments to hinterland households from hinterland sector output	F6	G6 Government transfers to hinterland households	H6 Total hinterland household income
Exogenous accounts	A7 Indirect taxes, VAT, subsidies, imports from ROW of town sector output	B7 Payments to households in ROW from town sector output	C7 Savings/ direct taxes of town households	D7 Indirect taxes, subsidies, imports from ROW of hinterland sector output	E7 Payments to households in ROW from hinterland sector output	F7 Savings / taxes of hinterland households	G7	H7
Total	A8 Total input value of town sector output	B8 Total factor payments of town	C8 Total town household expenditure	D8 Total input value of hinterland sector output	E8 Total factor payments of hinterland	F8 Total hinterland household expenditure	G8	H8

Source: Mayfield et al., 2005.

Appendix A.III: List of accounts in inter-local SAMs of Marketowns

Production account:

1. Arable farming
2. Dairy farming
3. Arable farming Intensive farming
4. Horticulture-open ground
5. Horticulture-glass
6. Forestry and fishery
7. Mining of coal, oil and gas
8. Other mining (sand, clay, salt etc)
9. Chemical products
10. Food manufacturing
11. Textile, leather
12. Wood, furniture
13. Paper, offset printing
14. Rubber, plastic, glass
15. Metals, machines
16. Electric apparatus, computers, optical equipment
17. Transport equipment
18. Electricity, water
19. Construction
20. Wholesalers
21. Retailers
22. Hotels, restaurants and catering
23. Transport services
24. Bank, finance and insurance services
25. Real estate, other business services
26. Public administration, education, health, recreation, culture
27. Personal services

Production factor account:
1. Labour income management/professional
2. Labour income skilled/partly or unskilled non-manual
3. Labour income skilled manual
4. Labour income partly or unskilled manual

Households account:
1. 1st 25%-income group
2. 2nd 25%-income group
3. 3rd 25%-income group
4. 4th 25%-income group

Exogenous account:
1. Sum of *rest of world account* (imports/exports), *government account* (taxes/subsidies) and *capital account* (savings/investments).